

The Importance of the **Number Line** in Understanding Fractions

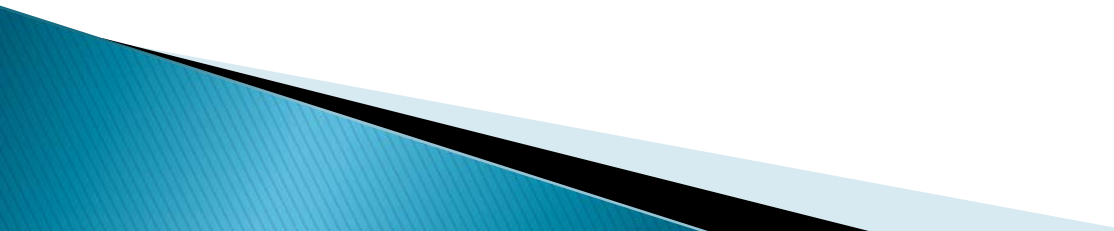
NCTM, April, 2014 New Orleans

Arjan Khalsa
Julie McNamara

Why The Number Line?



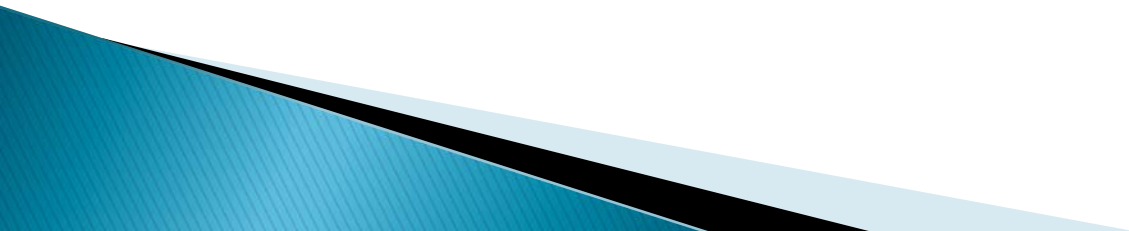
Support for the Number Line

- ▶ NAEP Results
 - ▶ Natural extension from students' work with fraction kits and area models
 - ▶ Common Core State Standards for Mathematics
- 

Number and Operations – Fractions

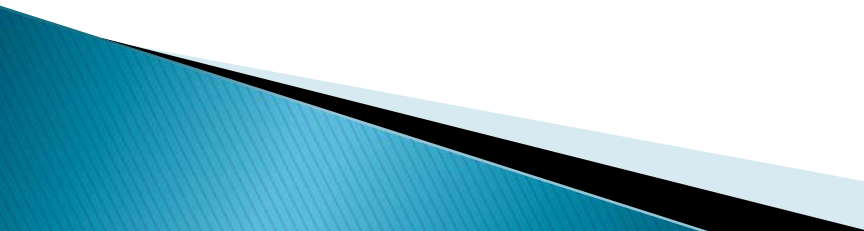
Grade 3

Develop understanding of fractions as numbers.



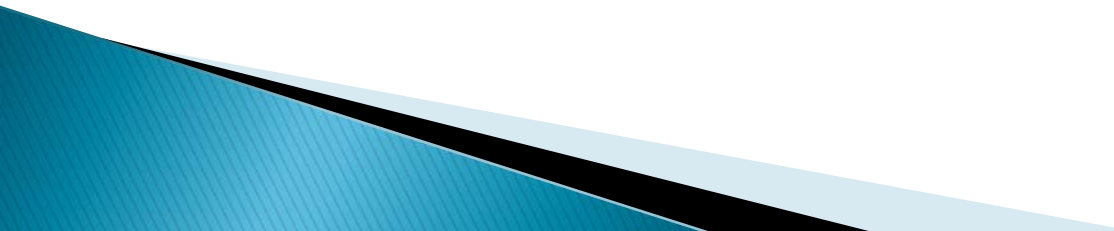
Number and Operations – Fractions

Grade 4

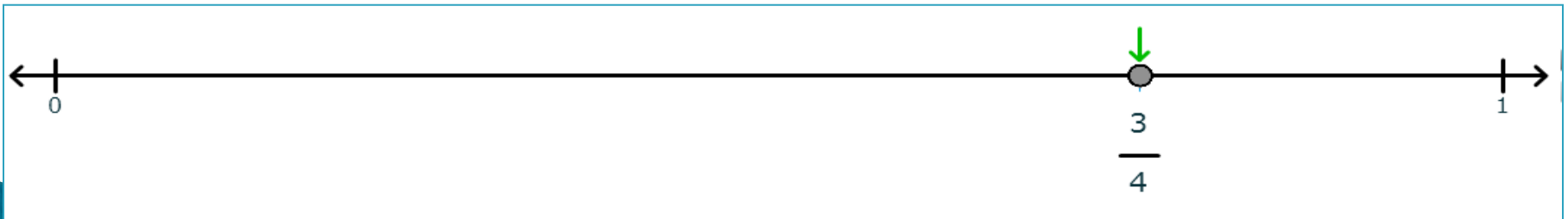
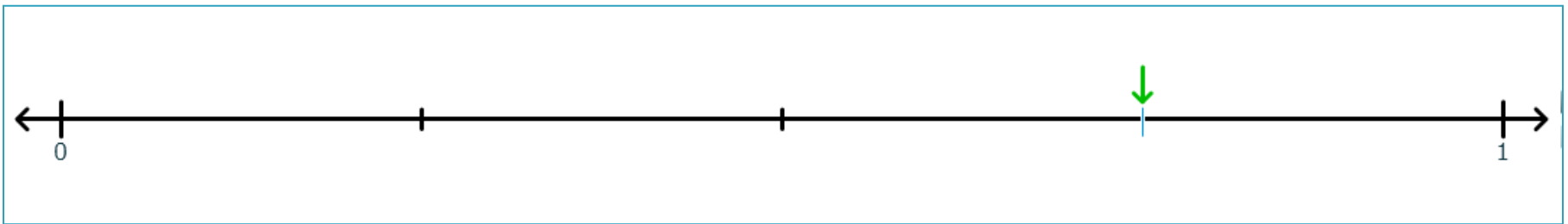
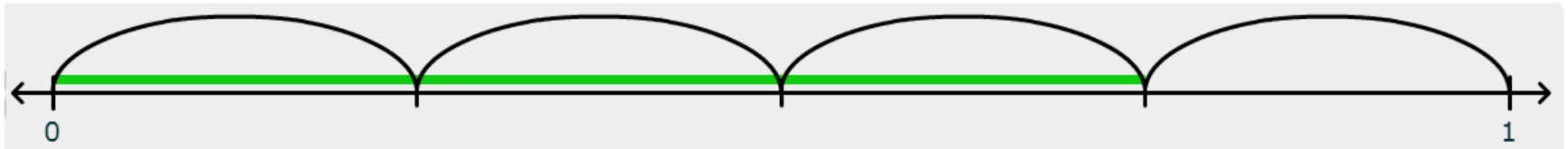
1. Extend understanding of fraction equivalence and ordering.
 2. Build fractions from unit fractions by applying and extending previous understandings of operations on whole numbers.
 3. Understand decimal notation for fractions, and compare decimal fractions.
- 

Number and Operations – Fractions

Grade 5

1. Use equivalent fractions as a strategy to add and subtract fractions.
 2. Apply and extend previous understandings of multiplication and division to multiply and divide fractions.
- 

Multiple Representations



Understanding Fractions



Part–Whole Relationships

- ▶ Part of an object, an area
- ▶ Part of a set or collection
- ▶ Part of a distance

Create a
representation that
shows $\frac{1}{3}$

Defining a Fraction

What does it mean to be $1/3$?

▶ Measurement definition

- A length (area/value) is $1/3$ of another length (area/ value) if it takes three copies or iterations of the first length (area/value) to complete the whole.

▶ CCSSM Definition

- Understand a fraction $1/d$ as the quantity formed by 1 part when a whole is partitioned into d equal parts; understand a fraction n/d as the quantity formed by n parts of size $1/d$.

Using Free Fractions Tools

▶ iPad

- Go to the iTunes App Store
- Download *Conceptua Math*


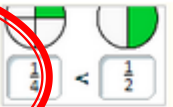
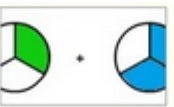

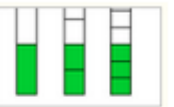








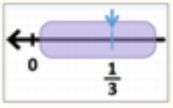

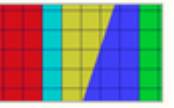
▶ Laptop

- www.conceptuamath.com
- Student sign in (upper right corner)

▶ Log in

- Customer: nctm2014
- Sign in: s1 s33
- Password: 1234

Fractions Tools

Fractions			Multiplication & Division		
Concepts to Procedures					
					
Identify Fractions	Compare Fractions	Add Fractions with Common Denominators	Subtract Fractions with Common Denominators	Make Equivalent Fractions	Multiply Fractions
					
Make Equivalent Fractions with Word Sentences	Common Denominators	Adding Fractions with Uncommon Denominators	Subtract Fractions with Uncommon Denominators	Divide Fractions - Partitive	Divide Fractions - Measurement
Higher Order Thinking					
					
Place Fractions on a Number Line	Estimate Fractions with Benchmarks	Unitize Fractions using Pattern Blocks	Unitize Fractions on a Grid		

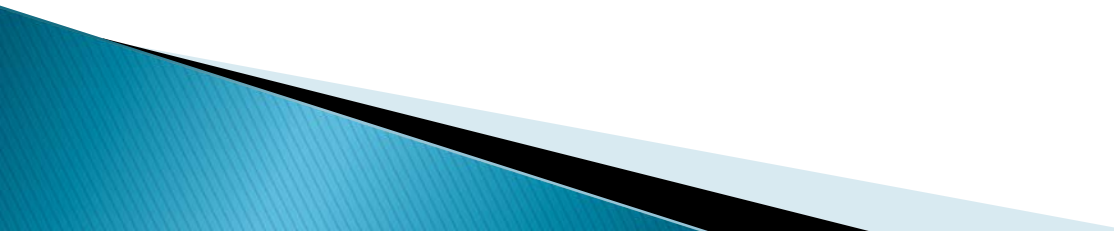
Understanding Fractions as Numbers

Location on a Number Line
Estimation and Precision


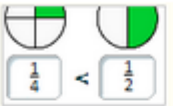


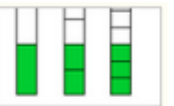







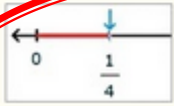
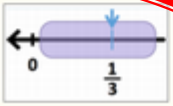

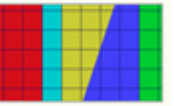
Comparisons and Equivalence




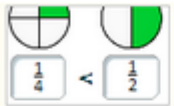
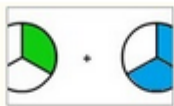





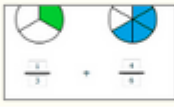




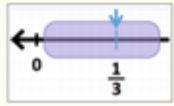

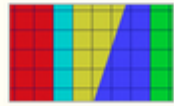
Fraction Tents – Hands On

1. Talk with your partner or table group about where your number should go on the number line.
 2. Once you agree, place your number on the string.
 3. Return to your seat and discuss the placement of the other numbers on the string. Should any of the numbers be moved? Why?
- 

Fractions Tools

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Higher Order Thinking					
					
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Tools in Action



Division with Fractions – A Very Difficult Topic

The Importance of Language
Using a Double Number Line

Types of Division Situations

- Partitive Division: group size is unknown
- Measurement Division: number of groups is unknown.
 - (also called Quotative)
- *-Carpenter, Fennema, Franke, Levi, and Empson 1999*

Partitive Division

- ▶ Arjan left his hotel, went to a jazz club, and then walked back later, a very happy person. When he checked his GPS, he saw that he had walked a total $\frac{3}{4}$ of a mile.
- ▶ How far did he walk to go to the jazz club? How long was his one-way trip?

$\frac{3}{4}$ shared equally among 2

Measurement Division

- ▶ Julie has $\frac{3}{4}$ lb. of chocolate and needs $\frac{1}{2}$ lb. to make her favorite fudge recipe.
- ▶ How many batches of fudge can she make with the chocolate she has?

How many $\frac{1}{2}$ s are in $\frac{3}{4}$?

Free Materials



Try a Lesson

Step 1: Watch and learn about the Conceptua Math Lesson Sequence.



Lesson Opener Overview



Guided Lesson Overview



Lesson Closer Overview

Step Two: Preview one or both Lesson Sequences.

Make Equal Parts and Shade 1 Part

In this lesson, students make models by dividing whole shapes and number lines into equal parts. Students shade one part and are introduced to the term "unit fraction."

Try Lesson Opener

Try Guided Lesson

Try Lesson Closer



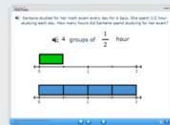
Multiply Unit Fraction by Whole Number

In this lesson, students create models to solve word problems that require multiplying a unit fraction by a whole number. Students also learn to use the 'groups of' paraphrase.

Try Lesson Opener

Try Guided Lesson

Try Lesson Closer



Class Dashboard | Big Idea Library | Tool Library | Implementation | Class Management

Do a Classroom Pilot

Give your students the experience of rich classroom discussions about math, anchored in visual and conceptual learning. The Classroom Pilot is designed to make it convenient for you to test-drive Conceptua Math. First, preview the topics, choose one of them, then register and add students to use with your class. When you complete the pilot, explore all the resources that will fulfill your curriculum needs. See how the Conceptua Math curriculum can help you transform the teaching and learning of mathematics in your classroom.



Classroom Pilot Overview

Choose a Topic:

Model Part/Whole Relationships Divide models into equal parts and shade parts of a whole.	Fractions	Grade 3	Preview
Multiplication: Groups of 5 and 10 Uses models and strategies to develop deep understanding of multiplication.	Multiplication & Division	Grade 3	Preview
Understanding Equivalent Fractions Find equivalent fractions using a variety of representations.	Fractions	Grade 4	Preview
Multiply a Fraction by a Whole Number Multiply unit fractions, proper fractions, and mixed numbers by whole number.	Fractions	Grade 5	Preview

More Free Fractions Tools



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Students 1

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Teacher in the
Equation

www.conceptuamath.com

Julie McNamara

- ▶ juliemcmath@gmail.com
- ▶ *Beyond Pizzas and Pies: 10 Essential Strategies for Supporting Fraction Sense, (Math Solutions)*
- ▶ Upcoming workshops:
 - *319– Understanding Fraction Computation by Applying and Extending Previous Understandings*
 - *Friday, 4/11, 8:00–9:15, 210 (Convention Center)*

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